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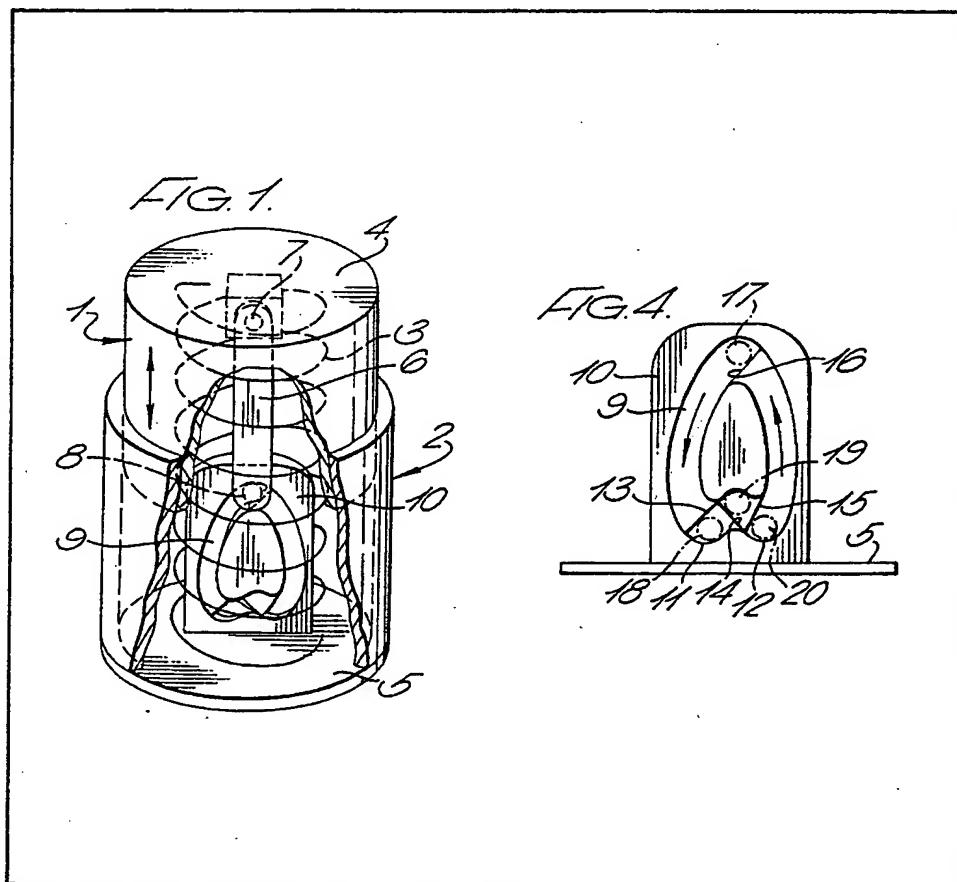
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(54) Mechanism for retaining two members in two different relative positions

(57) A push-push mechanism for retaining first and second members, which are movable relative to each other against a bias, in two different relative positions, such that application of external pressure moves the two members from a first position to a second position against the bias. Upon

release of this pressure the members are retained in this second position until further external pressure is again applied and released, at which time the members are urged by the bias to resume the first position. The mechanism comprises a cam follower (8), attached to the first member (1), a cam track (9) having first and second cam follower retaining parts, at least one guide path for the cam follower interconnecting the first and second retaining parts connectable to the second member, and biasing means (3), for biasing the first and second members such that the cam follower is urged into either one of the cam follower retaining parts. The guide path or guide paths are constructed such that the cam follower is constrained to move alternately between the cam follower retaining parts as the two members are moved relative to each in a reciprocating manner by the intermittent application of external pressure.



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FIG. 1.

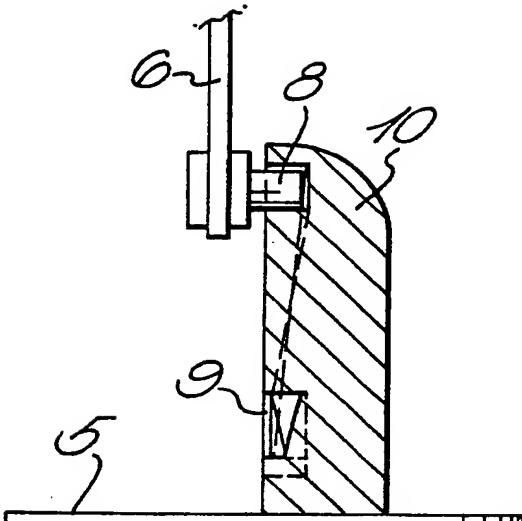
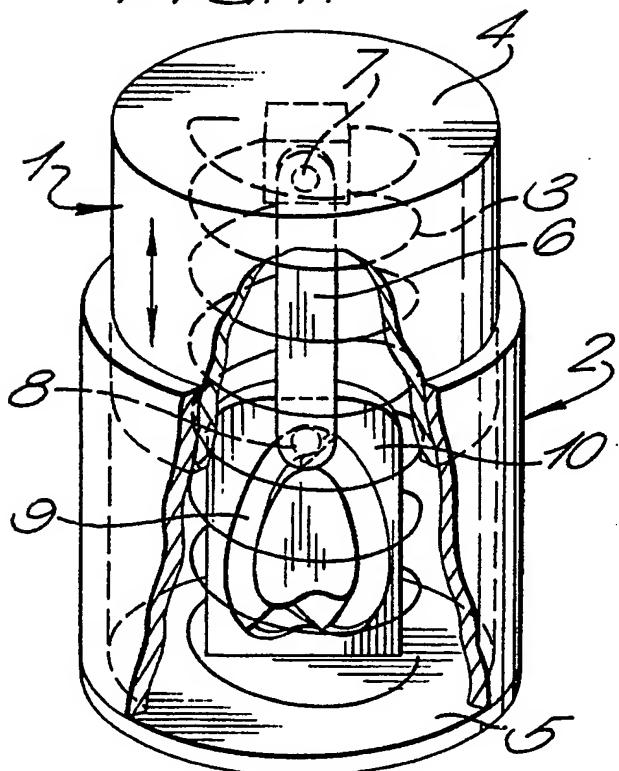


FIG. 3.

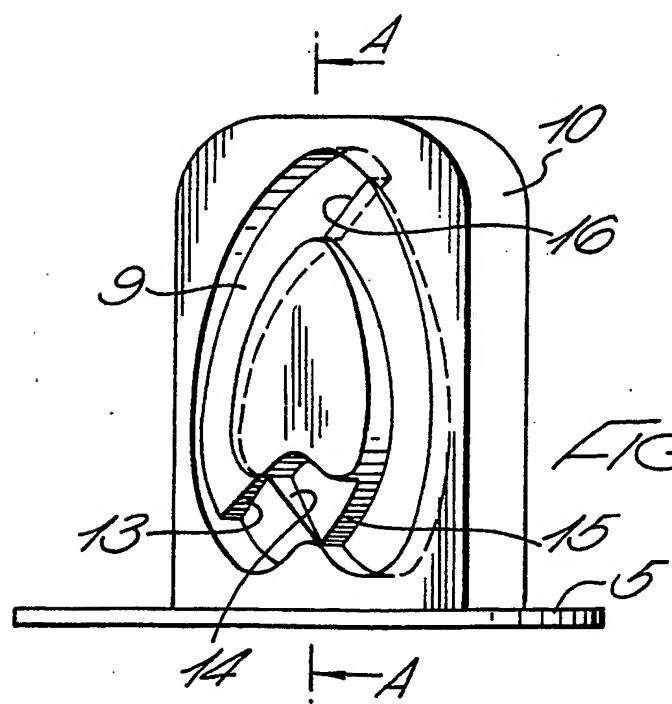
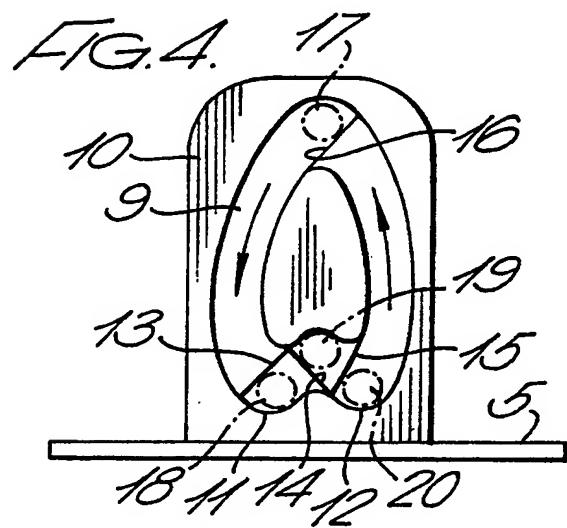


FIG. 2.



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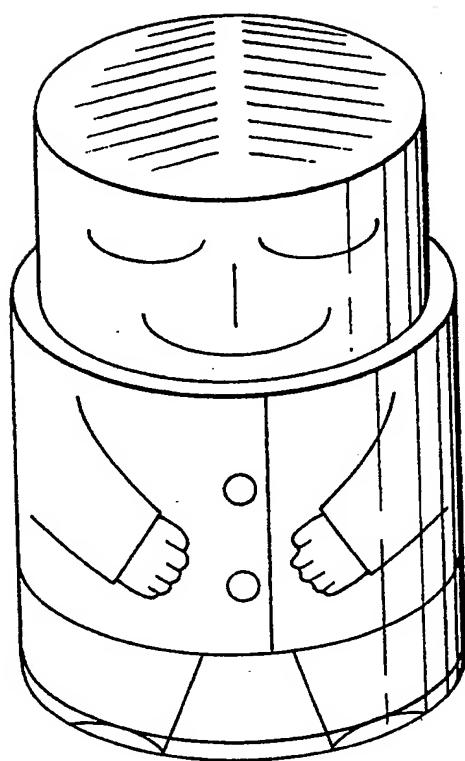


FIG. 6.

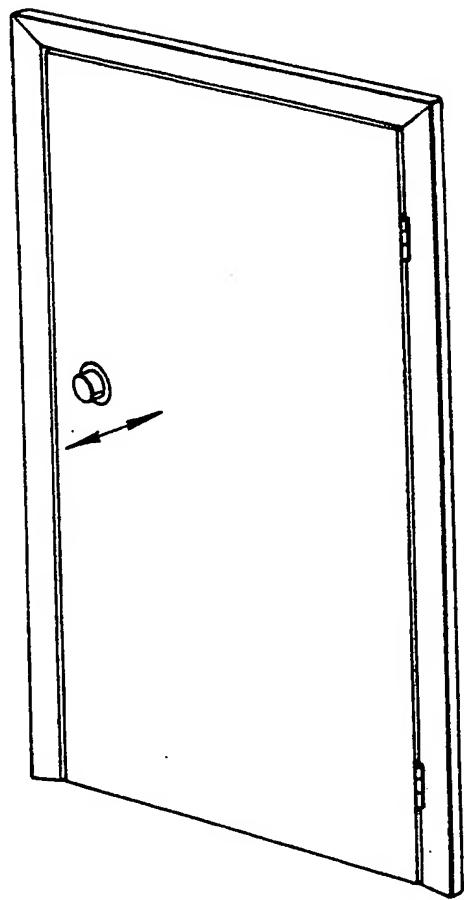


FIG. 5.

SPECIFICATION

Mechanism for retaining two members in two different relative positions

5 This invention relates to a mechanism for retaining two members, which are movable relative to each other, in first and second positions.

According to the broadest form of the invention, 10 there is provided a mechanism for retaining first and second members, which move relative to each other, in a first and a second position, comprising.

- (a) a cam follower connectable to the first member,

15 (b) a cam track having first and second cam follower retaining parts and at least one guide path for the cam follower interconnecting the first and second retaining parts connectable to the second member, and

- (c) biasing means for biasing the first and second members such that said cam follower is urged into either one of the cam follower retaining parts, and wherein the or each guide path is constructed to guide the cam follower alternately from one cam 25 follower retaining part to the other as the first and second members are moved relative to each other against the biasing means, in a reciprocating manner.

According to a particular form of the invention, 30 there is provided a reciprocable device having two relatively slidable portions which can move between first and second positions, comprising

 - (a) a cam follower connected to the first portion,
 - (b) the second portion having first and second 35 cam follower retaining parts and at least one guide path for the cam follower interconnecting the first and second retaining parts, and
 - (c) biasing means for biasing the first and second portions such that the cam follower is urged into 40 either one of the cam follower retaining parts, and wherein the or each guide path is constructed to guide the cam follower alternately from one cam follower retaining part to the other as the first and second members are moved relative to each other 45 against the biasing means in a reciprocating manner.

Preferably, the cam follower is attached to or integral with a cam follower arm which is attached to the first portion. The guide path may be in the form 50 of at least one groove and at least one step may be provided in the base of the or each groove such that the or each step co-operates with the cam follower to ensure that the cam follower moves alternately from one of the cam follower retaining parts to the other 55 as the first and second portions are moved relative to each other against the biasing means, in a reciprocating manner. Provision may be made to bias the cam follower against the base of the groove. Further preferred is a device in which the cam 60 follower arm is pivotally attached to the first portion, the cam follower arm being formed of a resilient material such that it can flex in a plane at right angles to its swinging plane.

Particular applications for the device are as a door handle and as an article for amusement. When

adapted for use as an article for amusement (i.e. a toy), the exterior of the first portion may be shaped and painted to resemble a head which may then be caused to reciprocate within the second portion

70 (which may be similarly shaped and painted to resemble a body) by applying manual pressure.

One embodiment of the invention is now described by way of example with reference to the accompanying drawings, in which:-

75 *Figure 1* is a part cut-away view of a reciprocating device;

Figure 2 is a perspective view of a typical cam track or guide path in the form of a groove in part of a base portion of the device;

80 *Figure 3* is a section on the line A-A of *Figure 2* but also indicating the manner in which a cam follower on a further portion of the device is offered up to the guide groove;

Figure 4 is a schematic view showing the various 85 positions of the cam follower in the guide groove during a complete reciprocating cycle of the device;

Figure 5 shows the device in use as a door knob, and

Figure 6 shows the device in use as an article for 90 amusement.

Referring to the drawings, a cylindrical first portion 1 is received within a second cylindrical (base) portion 2 and is constrained so as just to slide axially relative to the base portion 2 (e.g. by splines, not shown), the two portions being biased apart by a helical spring 3 which bears against two plates 4 and 5, plate 4 being attached to first portion 1, and plate 5 being attached to second portion 2. (The plates may be integral with their respective portions).

100 A cam follower arm 6 is pivotally connected to a block on the underside of the plate 4 of the first portion 1 about a pivot 7 and has a cam follower 8 on its free end which runs in a guide path or groove 9 formed, as will be described, on the base portion 2.

105 The cam follower arm 6 is manufactured from a resilient material (for example a plastics material) and is so shaped that it has some springiness in the direction perpendicular to the plane of movement allowed by the pivot 7, thus providing a bias

110 ensuring that the cam follower 8 remains in contact with the base of the guide groove 9.

The guide groove 9 is formed in a block 10 which is attached to, but may be integral with, the plate 5 of the base portion 2. In this embodiment, the guide 115 groove is generally heart shaped with its two lobes 11 and 12 situated furthest away from the pivot 7 of the cam follower arm 6.

The guide groove 9 is provided with a series of steps 13, 14, 15 and 16 in its base which co-operate 120 with the cam follower 8 to ensure that the cam follower moves alternately from one cam retaining part to the other (positions 17 and 19, *Figure 4*) as the two portions 1, 2 are reciprocated relative to each other.

125 A complete operating cycle of the mechanism will now be described to elucidate further the manner in which the components co-operate.

In the fully extended position (as depicted in *Figure 1*) the two portions 1 and 2 are biased apart by 130 the action of the helical spring 3 bearing on the end

plates 4 and 5. Movement of the first portion under the bias of the spring 3 is constrained, however, by the co-operation of the cam follower 8 in cam follower retaining part 17. As external pressure is applied to the device, causing the two main portions to slide together against the bias provided by the spring 3, the cam follower 8 at the end of the cam follower arm 6 is forced to travel down the guide groove 9, i.e. in the direction shown by the arrow in Figure 4. The cam follower is prevented from moving down the other section of the guide groove 9 by step 16 which co-operates with the cam follower allowing only the motion towards position 18. The guide groove 9 becomes progressively shallower, from position 17 to position 18 so that the motion of the cam follower in this direction pushes it outwardly (with respect to the plane at the paper in Figure 4) against the bias provided by the cam follower arm. This bias ensures that as the cam follower passes over the downward step 13 it is urged back against the base of the guide groove 9. When the cam follower reaches position 18, the portion 1 cannot move any further in the same direction within the portion 2 under the influence of external pressure because of co-operation between the cam follower and the side of the groove. Upon cessation of the external pressure, the spring bias moves the two portions 1 and 2 apart again which consequently causes the cam follower 8 to move upwardly along the guide groove to position 19. It is prevented from returning to position 17 by the co-operation of the cam follower with step 13. The cam follower traverses downwards step 14 before reaching position 19 and the cam follower is again urged towards the base of the guide groove 9 by the bias supplied by the cam follower arm 6. Position 19 is the second cam follower retaining part of the guide groove, retaining the cam follower as it does against the bias of the spring 3 which in turn maintains the two portions in the retracted position. When external pressure is again applied to the two portions 1 and 2, the cam follower is caused to move from position 19 to position 20, being prevented from returning to position 18 by the co-operation of the cam follower with step 14. The cam follower traverses downwards step 15 before reaching position 20. Position 20, in common with position 18, limits the extent of the slidable motion caused by the application of external pressure. When the external pressure is released, the two portions slide apart and the cam follower 8 moves from position 20 to position 17. The guide groove becomes progressively shallower from position 20 to position 17 so that the motion of the cam follower in this direction pushes it outwards against the bias provided by the cam follower arm 6. The cam follower traverses downwards step 16 before reaching position 17 and the cam follower is again urged towards the base of the guide groove by the bias provided by the cam follower arm.

Figures 5 and 6 exemplify two possible applications for the device described above.

Figure 5 shows a door, especially a door in a caravan, yacht or any such place where cramped living conditions are provided. The present invention may be utilised as an extendable means for gaining

purchase on a door in order to open it. For example, if one of the portions 1, 2 of the device described herein were fixed to and embedded in a door panel, then when the device was in its extended position, a useful knob would be presented with which to open the door. Simply by pushing the knob in, it could, for example, become flush with the door panel and remain in this retracted position until a further push releases the mechanism and allows the knob to protrude.

Figure 6 is an example of the type of amusement article, e.g. a toy, which can be manufactured, using as a major part the mechanism the subject of the present invention.

The device described above need not be a purely reciprocating device. Instead, the cam track could, for example, be connected to one end of an arm, the other end of which is pivotally connected to a second arm, and the cam follower could be connected to the opposite end of this second arm. In this way, the resultant mechanism, including the spring, cam track and cam follower could be used to hold the arms in two different relative positions.

One possible alternative method of manufacture of the device, the subject of the present invention, is to form the cam follower arm integrally with the first portion. For example, the first portion, the cam follower arm and the cam follower could be formed in one piece from a plastics material, or any other mouldable material, by injection moulding or any other appropriate technique. In the same way, the cam follower retaining parts and the guide path or guide paths may be formed integrally with the second portion. When the first portion is fashioned in one piece, the design, and the choice of material used, must allow for movement of the free end of the cam follower arm in a plane parallel to the plane generally defined by the guide path or paths interconnecting the two cam follower retaining parts.

Where the guide path or paths are in the form of a groove or grooves in the base of which at least one step is provided, provision must be made in the design for sufficient rigidity of the cam follower arm in a direction at right angles to the plane generally defined by the base of the groove or grooves such that the resilience of the material used to manufacture the first portion provides the necessary bias to urge the cam follower, at the end of the cam follower arm, into co-operation with the base of the groove or grooves.

CLAIMS (filed on 26 April 1982)

1. A mechanism for retaining first and second members, which move relative to each other, in a first and a second position, comprising
 - (a) a cam follower connectable to the first member,
 - (b) a cam track having first and second cam follower retaining parts and at least one guide path for the cam follower interconnecting the first and second retaining parts connectable to the second member, and
 - (c) biasing means for biasing the first and second members such that said cam follower is urged into

either one of the cam follower retaining parts, and wherein the or each guide path is constructed to guide the cam follower alternately from one cam follower retaining part to the other as the first and second members are moved relative to each other against the biasing means, in a reciprocating manner.

2. A reciprocatable device having two relatively slidable portions which can move between first and second positions, comprising

- (a) a cam follower connected to a first portion,
- (b) the second portion having first and second cam follower retaining parts and at least one guide path for the cam follower interconnecting the first and second retaining parts, and
- (c) biasing means for biasing the first and second portions such that the cam follower is urged into either one of the cam follower retaining parts, and wherein the or each guide path is constructed to guide the cam follower alternately from one cam follower retaining part to the other as the first and second members are moved relative to each other against the biasing means in a reciprocating manner.

3. A device according to claim 2 wherein the cam follower is attached to or integral with a cam follower arm, the cam follower arm being attached to or integral with the first portion.

4. A device according to claim 2 or 3 wherein the or each guide path is a groove formed in the second portion.

5. A device according to claim 4 wherein at least one step is provided in the base of the or each groove such that the or each step co-operates with the cam follower to ensure that the cam follower moves alternatively from one of the cam follower retaining parts to the other as the first and second portions are moved relative to each other against the biasing means in a reciprocating manner.

6. A device according to claim 4 or 5 wherein the cam follower is biased against the base of each groove.

7. A device according to any one of claims 2-6 wherein the cam follower arm is pivotally attached to the first portion so that it can swing in one plane, the cam follower arm being formed of a resilient material such that it can flex in a plane at right angles to its swinging plane.

8. A device according to any one of claims 2-6 wherein the cam follower arm is integral with the first portion and formed of resiliently deformable material, such that the cam follower is biased into engagement with the guide path and first and second retaining parts in the second portion.

9. A device according to any preceding claim when used as a door handle.

10. A device according to any of the preceding claims when used in an article for amusement.

11. A mechanism substantially as hereinbefore described with reference to the accompanying drawings.

12. A device substantially as hereinbefore described with reference to the accompanying drawings.

New claims or amendments to claims filed on 10.12.81
Superseded claims 1 to 12
New or amended claims:- 1 to 10

70 1. A mechanism for retaining first and second members, which are capable of movement relative to each other, in a first and a second position, comprising

- (a) a cam follower connected to the first member,
- (b) a cam track having first and second cam follower retaining parts and at least one groove formed in the second member interconnecting the first and second retaining parts, and
- (c) biasing means for biasing the first and second members such that the said cam follower is urged into either one of the cam follower retaining parts, and wherein at least one step is provided in the base of the or each groove such that the or each step co-operates with the cam follower to ensure that the cam follower moves alternatively from one of the cam follower retaining parts to the other as the first and second portions are moved relative to each other against the biasing means in a reciprocating manner.

2. A device having two relatively slidable portions which are capable of reciprocating motion and are retainable in a first and a second position, comprising

- (a) a cam follower connected to a first portion,
- (b) a cam track having first and second cam follower retaining parts and at least one groove formed in the second portion interconnecting the first and second retaining parts, and
- (c) biasing means for biasing the first and second portions such that the said cam follower is urged into either one of the cam follower retaining parts, and wherein at least one step is provided in the base of the or each groove such that the or each step co-operates with the cam follower to ensure that the cam follower moves alternatively from one of the cam follower retaining parts to the other as the first and second portions are moved relative to each other against the biasing means in a reciprocating manner.

3. A device according to claim 2 wherein the cam follower is attached to or integral with a cam follower arm, the cam follower arm being attached to or integral with the first portion.

4. A device according to claim 2 or 3 wherein the cam follower is biased against the base of each groove.

5. A device according to any one of claims 2-4 wherein the cam follower arm is pivotally attached to the first portion so that it can swing in one plane, the cam follower arm being formed of a resilient material such that it can flex in a plane at right angles to its swinging plane.

6. A device according to any one of claims 2-4 wherein the cam follower arm is integral with the first portion and formed of resiliently deformable material, such that the cam follower is biased into engagement with the groove and first and second retaining parts in the second portion.

7. A device according to any preceding claim

when used as a door handle.

8. A device according to any of the preceding claims when used in an article for amusement.

9. A mechanism substantially as hereinbefore described with reference to the accompanying drawings.

10. A device substantially as hereinbefore described with reference to the accompanying drawings.

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